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A VEHICLE ADAPTED FOR DIFFERENT DRIVING MODES, AND A METHOD OF DRIVING SUCH VEHICLES

FIELD OF THE INVENTION

The present invention relates to a so-called semitrailer and more specifically to a semitrailer of the kind defined in the preamble of Claim 1.

Prior publications SE,B,7506711-6 (Publication No. 402 343) (Storm) and its American counterpart U.S.-A 4,048,925 teach a vehicle that can be driven on roads and on railroad tracks.

A lighter vehicle of the transport van type or some similar vehicle that can be driven on both a road surface and a railway track is described in SE,C,9401479-2 (Publication No. 502 692) (SRS et al).

Hitherto, it has not been considered possible to equip really large and heavy vehicles of the semitrailer type for driving on both road surfaces and railroad lines.

The semitrailer is normally coupled to the traction vehicle via a device that includes a vertical swivel shaft of "turntable"/"kingpin" type. Different types of more or less standardised traction vehicles are used, providing that the vehicle used, and then particularly the so-called kingpin or swivel shaft, is able to cope with the load carried by a semitrailer.

These difficulties have been associated, *inter alia*, with the belief that the large length of the vehicle and the load-take-up kingpin between traction vehicle and trailer would make it impossible to convert the vehicle between different driving modes, particularly to a mode in which the vehicle can be driven on railroad tracks. In addition, the double wheel setup of the traction vehicle causes special problems. However, the present invention offers a way of overcoming these difficulties in a simple manner.

OBJECT OF THE INVENTION

Accordingly, a main object of the invention is to provide a very long and heavy road vehicle of the semitrailer type with elements necessary for enabling the vehicle to be converted to a railroad driving mode. Another object is to facilitate driving of the semitrailer onto a railroad track.

SUMMARY OF THE INVENTION

The first mentioned object is fulfilled by an inventive vehicle of the aforesaid kind, which includes the features set forth in the characterising clause of Claim 1.

The invention is based on the insight that the vertical force-take-up kingpin or swivel axle by means of which the trailer part of the vehicle is connected to said traction vehicle can be used for driving the vehicle onto the railroad track in conjunction with converting the vehicle to its railroad mode and also in conjunction with driving the vehicle from the railroad track when the vehicle shall be converted back to its road driving mode. Thus, it is sufficient to equip solely the semitrailer with a vertically movable rail-wheel unit at each end of the trailer. In this regard, the semitrailer can be released from the traction vehicle in conjunction with driving the semitrailer onto the railroad track and, in conjunction therewith, to move the front vertically movable rail-wheel unit of the semitrailer in said release operation.

The traction vehicle need not be equipped for track-bound operation, but can be used for other purposes when using the semitrailer for the transportation of goods on a railroad system.

In many instances, it is convenient when at least one of the rail-wheel units is comprised of a bogie that includes two rail-wheel axles.

However, one or both rail-wheel units may comprise a unit that has a single axle. When the rear-wheel unit is a single-axle unit, it may be convenient for the unit to be equipped with an outwardly swingable support element having an axle which carries an additional rail wheel for engagement with the rails of the track when driving the vehicle onto the track.

At least one of the rail-wheel units may include a drive motor for driving the semitrailer on the track. According to another embodiment, which is important in principle, both rail-wheel units lack such drive means. Reversal of the trailer onto the track is achieved with the aid of the traction vehicle, while track-bound traffic is dealt with with the aid of a separate railroad engine or some other pulling vehicle.

It is also possible to connect together two or more semitrailers to form a "trailer train" for driving on the railroad system in one or the other of said methods, depending on what is required of the vehicle driven on the railroad system.

All axles may thus be non-driven, so-called "running axles" or one or more axles may, alternatively, be driven. The axles may be both non-braked and braked depending on the requirements applying to types of vehicle to be used on the railroad system.

The front rail-wheel unit may be fixed in its position parallel with the track.

In order to be able to drive the vehicle onto and off the railroad track, it is necessary that the rear rail-wheel unit is able to swing about a vertical shaft, although means may be provided which enable the wheel unit to be fixed in its use position, parallel with the track.

There is normally required a level crossing approximately at the level of the upper edge of the track, in conjunction with driving the semitrailer onto and off the railroad track.

The invention also relates to a method of driving a semitrailer of the aforesaid kind onto a railroad track with the aid of a traction vehicle, for railroad operation. The inventive method comprises essentially the method steps set forth in Claim 8.

The semitrailer located on the railroad track can be coupled to a drive vehicle located on said track or secured, e.g., with the aid of brake shoes or chocks, before the traction vehicle is disconnected and driven away. A railway engine of the aforesaid kind can be dispensed with when one of the rail-wheel units includes a drive means. The means for operating brakes and for driving the vehicle may be placed on the semitrailer or on a separate track-bound unit.

Two or more semitrailers may be placed sequentially on the railroad track and connected together to form a "train".

The vehicle is removed from the railroad track by carrying out the method steps in the reverse order.

Further characteristic features of the invention will be apparent from the following description of preferred embodiments thereof, this description being made with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side view of a so-called semitrailer according to the invention, adapted for road driving.

Fig. 2 is a side view of the semitrailer shown in Fig. 1, intended for track-bound driving, with the traction vehicle disconnected.

Sections a, b, c and d of Fig. 3 are plan views showing adjustments from a road driving mode to a railroad driving mode in conjunction with driving the semitrailer up onto a railroad track.

DESCRIPTION OF PREFERRED EMBODIMENTS

Fig. 1 illustrates a semitrailer 1 and a traction vehicle 2 intended for driving on a road surface A. Fig. 2 shows the semitrailer 1 disconnected from the traction vehicle and adapted for driving on a railroad track B.

The semitrailer 1 has a loading platform 1a and a front part 1b provided with a swivel plate 11, which forms a part of the pivotal force take-up coupling device 10 that couples the semitrailer 1 and the traction vehicle 2 together.

In the illustrated embodiment, the coupling device on the traction vehicle is a so-called kingpin 12. A coupling device 10 of this nature is able to take-up the load on the semitrailer in the performance of its various tasks.

The rear part of the semitrailer 1 is provided with road wheels 5 carried on wheel axles 5a. The semitrailer also includes a front and a rear rail-wheel unit 7, 8 which, in the illustrated embodiment, each have the form of a bogie and each include two wheel axles 15a carrying rail wheels 15. The rear rail-wheel unit 8 is disposed behind the road wheels 5, while the front rail-wheel unit 7 is disposed in the region 1c between the load-carrying platform portion 1a and the front part 1b of the semitrailer, i.e. behind the swivel plate 11 of the semitrailer functioning as a coupling part.

At least the rear rail-wheel unit 8 can be swung about a vertical shaft 14, which may also apply to the front rail-wheel unit 7. However, the front-wheel unit 7 is normally fixed in a position parallel with the longitudinal axis of the semitrailer and the railroad track B, respectively. Both rail-wheel units 7, 8 can be moved vertically for the purpose of placing the rail-wheels onto the rails while lifting the semitrailer, such that the rear road wheels 5 will be lifted over the upper edge of the railroad track and also so that the swivel plate 11 will release its coupling engagement with the coupling part on the traction vehicle, this latter coupling part being referred to as a kingpin in the illustrated case.

Lifting of a bogie unit 7, 8 from the track and placing of said bogie unit on said track are effected with the aid of a device 20 whose major part includes a fixed horizontal arm or jib 21, a pivotal bar 22, a pivotal link element 23 located between the arm and the bar, and a pivotally mounted hydraulic ram 24 which engages the central part of said link element and which is mounted at the opposite end of the trailer.

A comparison made between Figs. 1 and 2 will make evident the movements carried out by the various elements between lifting the bogie units 7, 8 and placing said units on the railroad track B.

Either one of the bogie units 7, 8, or both of said bogie units, may, alternatively, comprise units provided with a single axle and conveniently including an outwardly pivotal rail-equipped support element that can be fixed in its use position.

Fig. 3 illustrates various phases connected with driving the semitrailer onto the railroad track, for conversion of the semitrailer from its road traffic mode to its railroad mode.

Fig. 3a) illustrates the complete vehicle, in other words shows the traction vehicle 2 and the semitrailer 1 coupled thereto being driven up to and over the "level crossing" or corresponding junction to be used. When essentially the entire vehicle has passed over the track, or has been reversed onto the track, the vehicle is aligned so that the semitrailer 1 will define an angle with the track in the on-driving direction, said angle being greater than 90°, and so that the rail-wheel unit 8, i.e. at the bogie shown in the illustrated embodiment, is located over the track. The bogie 8 is then lowered onto the track.

Downward movement is continued until the rubber wheels 5 of the semitrailer have been raised from the ground to an extent at which they are situated above the upper edge of the rail.

Fig. 3b) shows that the traction vehicle 2 is reversed towards the track at an angle relative to the semitrailer 1 such that the bogie will move along the track in the on-driving direction.

Fig. 3c) illustrates a position in which the traction vehicle has "pushed or shoved" a semitrailer to an extent at which it is located parallel with the track. In this position, the front rail-wheel unit 7 is pressed down against the track. Downward movement is continued to an extent at which the semitrailer 1 is released from the traction vehicle in the region of the articulated coupling 10.

If the semitrailer has rail wheels that are not braked, the semitrailer shall be coupled to a vehicle (not shown) present on the railroad tracks when in this position, or secured with the aid of chocks (not shown) before disconnecting the traction vehicle, i.e. raised so that the coupling part 11 belonging to the semitrailer and forming part of the coupling device 10 is released.

The traction vehicle 1 is then driven away, wherewith the semitrailer according to Fig. 3d) and Fig. 2 respectively is adapted to its railroad track mode and, e.g., can be coupled to a

railroad engine or, alternatively, can be driven by drive means provided in one of the rail-wheel units 7, 8.

The drive means for both brake shoes and for driving the vehicle may either be placed on the semitrailer or on some other track-bound vehicle.

Two or more semitrailers can be placed sequentially on the track and coupled together to form a "train".

The semitrailer is removed from the railroad track by carrying out the steps shown in Fig. 3a)-d) in the reverse order.